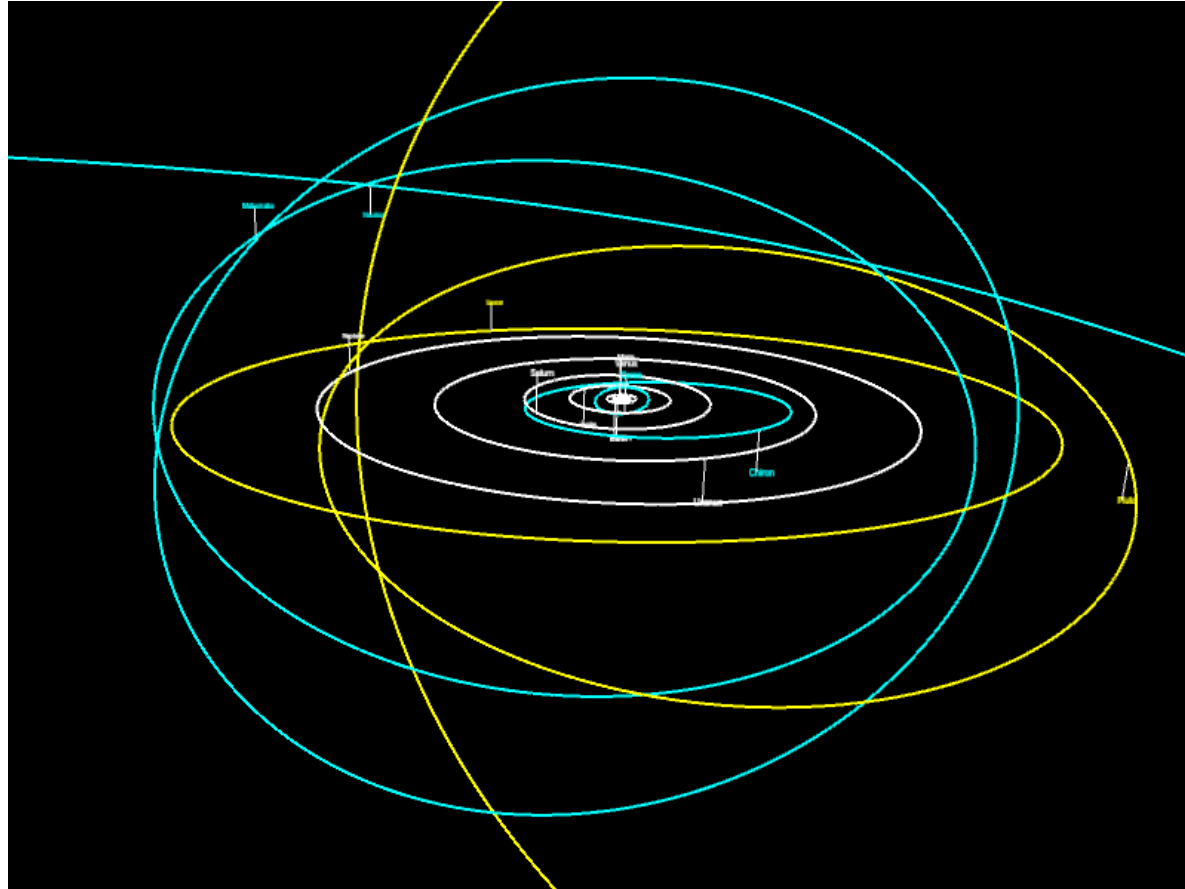


Solar System Orbits



Swinburne Astronomy Online 3D PDF

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1 Description

1.1 Solar system orbits

We often think of the planetary orbits as being regular and orderly, all orbiting the Sun in the same direction and in essentially the same plane, with plenty of space between each planet. But once we start including the orbits of the minor planets, we find that the Solar System contains a wide range of, often strange, orbits. In this 3D PDF, the orbits of the 8 planets are in white and you can toggle the orbits of the terrestrials and giants. Also included are the orbits of 8 minor planets: the main belt asteroid Ceres, the Centaur Chiron, and six Trans-Neptunian Objects (TNOs) including Pluto, Quaoar, Haumea, Makemake, Eris and Sedna. Five of these 8 minor planets are recognised as “dwarf planets” by the IAU: Ceres, Pluto, Haumea, Eris and Makemake.

- Ceres was discovered 1801 and was initially thought to be the “missing planet” between Mars and Jupiter. Other small bodies were soon found near its orbit and these were named asteroids (meaning “star-like”). Ceres is the largest asteroid in the asteroid belt and only dwarf planet in the inner Solar System. Its orbital parameters include a semi-major axis of 2.76 AU, eccentricity of 0.08 and orbital period of 4.6 years.
- Chiron is a Centaur discovered in 1977. It was originally classified as an asteroid, but was later found to exhibit comet-like activity. Its orbital parameters include a semi-major axis of 13.66 AU, and eccentricity of 0.38 and an orbital period of 50.5 years.
- Pluto was discovered in 1930, originally designated the 9th planet of the Solar System, but subsequently classified as a TNO and a dwarf planet. Its orbital parameters include a semi-major axis of 39.4 AU, and eccentricity of 0.25 and an orbital period of 246 years. Pluto is inclined 17 degrees to the ecliptic and is currently known to host 5 satellites.
- Quaoar is a TNO discovered in 2002. Its orbital parameters include a semi-major axis of 43.19 AU and eccentricity of 0.04, with an orbital period of almost 284 years. It has one known satellite.
- Eris is a TNO (and dwarf planet) discovered in 2005. Its orbital parameters include a semi-major axis of 68 AU and eccentricity of 0.44, with an orbital period of almost 561 years. Eris is more massive than Pluto and has one known satellite. Its orbit is inclined almost 44 degrees to the ecliptic.
- Haumea is a TNO (and dwarf planet) discovered in 2004. Its orbital parameters include a semi-major axis of 43 AU and eccentricity of 0.2, with an orbital period of 281 years. Haumea has a very elongated shape and hosts two known satellites.
- Makemake is a TNO (and dwarf planet) discovered 2005. Its orbital parameters include a semi-major axis of 45.5 AU and eccentricity of 0.16, with an orbital period of almost 307 years.
- Sedna is an extremely eccentric TNO discovered in 2003. Its orbital parameters include a semi-major axis of 543.8 AU and eccentricity of 0.86, with an orbital period of about 11,400 years.

1.2 How to use this 3D PDF

The interactive 3D content appears on the next page of this document. You can interact with the 3D content in a variety of ways. Most of these can be found in the 3D toolbar (see below) that appears when you move the mouse cursor over the 3D figure.



To start, click and hold the left mouse button anywhere within the 3D figure. Then move the mouse around and see how the orientation changes. You can use the right mouse button in the same way to zoom in and out. Other interaction modes are also available. You can explore these by clicking on the drop-down menu of the left-most icon on the 3D toolbar.

Every 3D figure has a default view, which can be returned to by selecting View 1 from the toolbar Views menu. Some figures may also have other interesting views available for you to try.

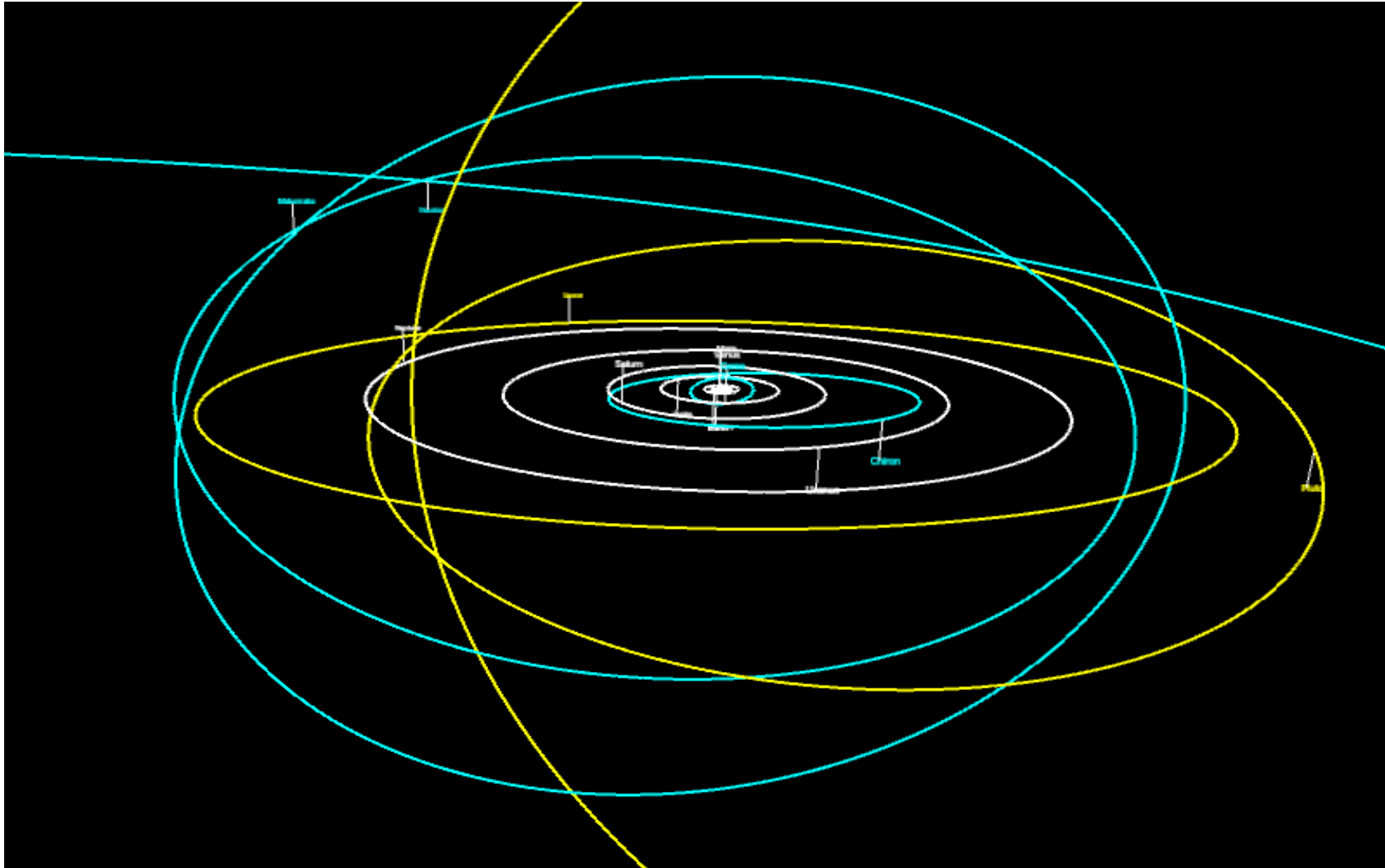
There are some additional keyboard shortcuts for you to use. (Note that you must first left mouse click on the 3D figure to utilise these shortcuts.)

arrow keys (up, down, left, right)	rotate the object
+ , -	zoom in or out
a	autospin
* , /	increase, decrease the autospin speed
[,]	roll the object clockwise, anti-clockwise
h	return to the default view

Some 3D figures may also allow you to show or hide certain types of objects from view. If available, this option will appear as a text link below the 3D figure, e.g. [Click here to...](#)

Note: The free Adobe Reader (Version 8 or higher) is required for these 3D PDFs.

2 Solar system orbits



[Click here to hide/show terrestrial orbits.](#)

[Click here to hide/show giant planet orbits.](#)

3 Credits

The data used for this PDF was sourced from JPL's HORIZONS ephemerides system.

The 3D content in this PDF document was prepared with S2PLOT (Barnes et al., 2006, PASA, 23, 82; Barnes & Fluke, 2008, New Astronomy, 13, 599).

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